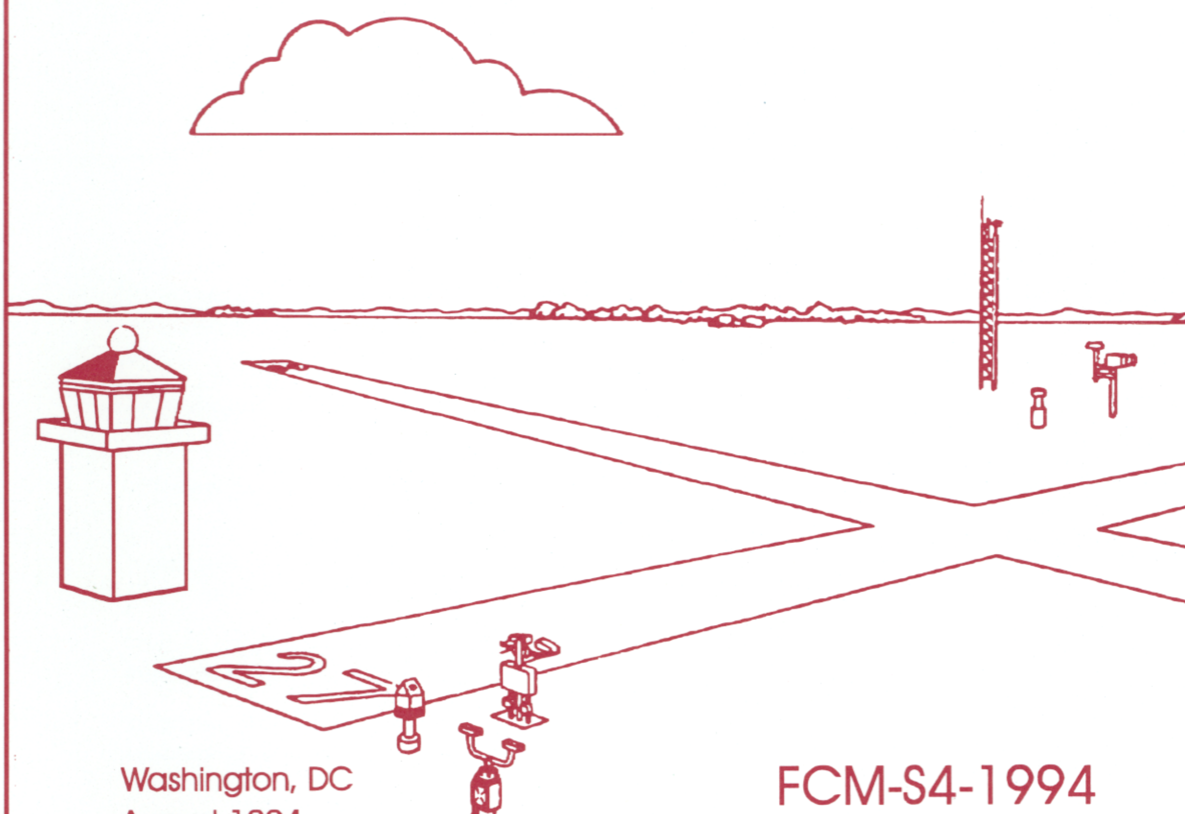
U.S. DEPARTMENT OF COMMERCE/ National Oceanic and Atmospheric Administration

OFCM

OFFICE OF THE FEDERAL COORDINATOR FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

Federal Standard for Siting Meteorological Sensors at Airports



Washington, DC
August 1994

FCM-S4-1994

THE FEDERAL COMMITTEE FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH (FCMSSR)

DR. D. JAMES BAKER, Chairman
Department of Commerce

VACANT
Department of Agriculture

CAPT BRADLEY SMITH, USN
Department of Defense

DR. ARISTIDES PATRINOS
Department of Energy

DR. DEBRA KNOPMAN
Department of the Interior

DR. EDWARD MALLOY
Department of State

VACANT
Department of Transportation

DR. JEFFREY PAYNE
Office of Management and Budget

MR. RICHARD T. MOORE
Federal Emergency Management Agency

DR. CHARLES F. KENNEL
National Aeronautics and Space Administration

DR. ROBERT W. CORELL
National Science Foundation

MR. WILLIAM G. LAYNOR
National Transportation Safety Board

DR. THEMIS P. SPEIS
U.S. Nuclear Regulatory Commission

MR. H. MATTHEW BILLS
Environmental Protection Agency

MR. JULIAN M. WRIGHT, JR.
Federal Coordinator

MR. JAMES B. HARRISON, Executive Secretary
Office of the Federal Coordinator for
Meteorological Services and Supporting Research

THE INTERDEPARTMENTAL COMMITTEE FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH (ICMSSR)

MR. JULIAN M. WRIGHT, JR., Chairman
Federal Coordinator

DR. NORTON D. STROMMEN
Department of Agriculture

MR. ROBERT C. LANDIS
Department of Commerce

CAPT BRADLEY SMITH, USN
Department of Defense

DR. HARRY MOSES
Department of Energy

MR. LEWIS T. MOORE
Department of the Interior

MR. JEFFREY MACLURE
Department of State

MR. RICHARD HEUWINKEL
Federal Aviation Administration
Department of Transportation

MR. FRANCIS SCHIERMEIER
Environmental Protection Agency

DR. FRANK Y. TSAI
Federal Emergency Management Agency

VACANT
National Aeronautics and Space Administration

DR. RICHARD S. GREENFIELD
National Science Foundation

MR. JAMES SKEEN
National Transportation Safety Board

MR. ROBERT A. KORNASIEWICZ
U.S. Nuclear Regulatory Commission

DR. JEFFREY PAYNE
Office of Management and Budget

MR. JAMES B. HARRISON, Executive Secretary
Office of the Federal Coordinator for
Meteorological Services and Supporting Research

FEDERAL COORDINATOR
FOR
METEOROLOGICAL SERVICES AND
SUPPORTING RESEARCH

6010 EXECUTIVE BLVD., SUITE 900
ROCKVILLE, MARYLAND 20852

FEDERAL STANDARD FOR SITING

METEOROLOGICAL SENSORS AT AIRPORTS

FCM-S4-1994
Washington, D.C.
August 1994

CHANGE AND REVIEW LOG

Use this page to record changes and notices of reviews.

Change Number	Page Numbers	Date Posted	Initial
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Changes are indicated by a vertical line in the margin next to the change.

Review Date	Comments	Initial

FOREWORD

The coordination of weather observing activities in the United States is complex. In addition to the Departments of Commerce (DOC), Defense (DOD), and Transportation (DOT), this effort requires the participation of commercial aviation interests who represent a large segment of the users of meteorological information.

This diversity mandates that the meteorological information distributed among Federal agencies and commercial users comply to established standards.

The Office of the Federal Coordinator for Meteorology (OFCM) through the Working Group for Surface Observations' Task Group for Surface Instrumentation Standards (TG/SIS) has developed standards for siting automated weather observing systems used at airports and heliports. This document addresses siting characteristics for exposure and placement of sensors. Siting characteristics are essential for the establishment of a standardized meteorological data network and necessary for aviation and other weather forecasting purposes.

While these siting standards define and establish specifications and guidelines, they contain sufficient flexibility for agencies to achieve the requirements through agency specific procedures.

To provide for an orderly transition to metric units, this document includes both English and metric dimensions. Until there is an official conversion to the metric system, English units will prevail.

Julian M. Wright, Jr.
Federal Coordinator for Meteorological
Services and Supporting Research

TABLE OF CONTENTS

CHAPTER 4 - HELIPORT SITING CRITERIA

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 PURPOSE.

This document establishes the Federal standard for siting meteorological sensors of automated weather observing systems at airports/heliports to collect meteorological data in support of aircraft operations as well as aviation and other weather forecasting. It will be used by Federal agencies as a basis for developing and implementing specific regulatory or technical documents. The standard applies to all Federally-owned and Federally-funded systems, as well as non-Federal systems that are to be approved by the Department of Transportation's (DOT) Federal Aviation Administration (FAA) or the Department of Commerce's (DOC) National Weather Service (NWS). Multiple users of meteorological data exist, and to the greatest practical extent, they have been considered in the development of this standard.

In Chapter 2, the standard provides criteria for proper and representative exposure of sensors to assure that data are meteorologically sound. Chapter 3 provides criteria for selecting locations for sensors at airports; Chapter 4 addresses heliport installations.

1.2 SCOPE.

This standard is intended to serve as the most fundamental reference for sensor siting. While this document is not of itself regulatory in nature, it is to be implemented through appropriate agency orders. Likewise, this standard may be modified or enhanced by agency directives. This document does not require agencies to change existing sensor installations solely to comply with this standard. It will be applied as new stations are established. The inclusion and description of a particular sensor in this document does not imply that such sensors will be used in all system applications.

In applying this document to the planning of an automated weather observing system site at an airport with a control tower, no site shall be finalized without consulting with representatives of both NWS and FAA.

Sensor siting in accordance with this standard meets the requirements of Section 77.15(c) of the Federal Aviation Regulations (FAR) and is exempt from further Part 77 study. Any exceptions to the standard or special situations will require an FAA Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) study in accordance with Part 77 of the FAR to determine if a substantial adverse effect would be created for aircraft operations.

The standard covers the following weather elements:

- Surface wind speed and direction
- Ambient air temperature
- Dew point temperature
- Atmospheric pressure
- Visibility
- Sky condition
- Precipitation type discrimination (rain, snow, drizzle, etc.)
- Precipitation occurrence (Yes/No)
- Freezing precipitation detection
- Precipitation accumulation
- Snowfall-snow depth
- Lightning detection

The standard does not address:

- Details of installation for individual manufacturers' sensors
- Shielding and/or venting of sensors, except in general terms
- Special application systems such as those designed to detect low-level wind shear
- Details of lightning protection

CHAPTER 2

SENSOR EXPOSURE

2.1 GENERAL.

Sensor siting shall not violate runway or taxiway object free areas, runway or taxiway safety areas, obstacle free zones, or instrument flight procedures surfaces as defined in FAA Advisory Circular (AC) 150/5300-13, Airport Design, or FAA Handbook 8260.3, TERPS. Notwithstanding these constraints, the sensor exposure will strive to minimize or eliminate the effects of manmade or geographical obstructions. The tower used to mount the wind sensor is not considered an obstruction to the sensor collection system, but it will (with the exception of the temperature, dew point, and pressure sensors) be at least 10 feet (3 meters) away from the other sensors. Sensors should be located as far as practicable from cultivated land to reduce contamination by dust and dirt. It may be necessary to increase the heights of some sensors based on the average maximum snow depth for the location, which will be determined by averaging the maximum annual snow depths over the period of record.

2.2 PRESSURE SENSOR.

The pressure sensor will be installed on the airfield, usually in a weatherproof facility (building, shelter, enclosure, etc.). When the pressure sensor is vented to the outside, a vent header will be used. In most cases, internal venting of the pressure sensors may be satisfactory. However, if it is determined that internal venting will affect the altimeter setting value by $\pm$ 0.02 inches of mercury or more, outside venting will be used. A portable transfer standard will be used to resolve any questions regarding the need for external venting. Siting that will cause pressure variations due to air flow over the venting interface should be avoided. The venting interface will be designed to avoid and dampen pressure variations and oscillations due to "pumping" or "breathing" of the pressure sensor venting and porting equipment. Each sensor will have an independent venting interface from separate outside vents (if outside venting is required) through dedicated piping to the sensors. The sensors should also be located in an area free of jarring, vibration, and rapid temperature fluctuations (i.e., avoid locations exposed to direct sunlight, drafts from open windows, and air currents from heating or cooling systems). If the pressure sensors are sited outdoors, the height of the vent header shall not be less than one foot above the average maximum snow depth, or 3 feet (1 meter) above ground level, whichever is higher.

Pressure sensor derived values are of critical importance to aviation safety and operations. Great care shall be taken to ensure that pressure sensor siting is suitable and accurate. The field and sensor elevations above Mean Sea Level (MSL) elevation shall be determined to the nearest whole foot in accordance with agency procedures. The distance between the elevation of the pressure sensors and the field elevation will not exceed 100 feet (30 meters).

The above criteria are applicable to altimeter-only systems, except: (1) the pressure sensor will be installed within 6 miles (9.6 kilometers) of the instrument runway threshold, (2) a temperature correction is used in the algorithm to compute altimeter setting, and (3) the elevation difference between the height of the pressure sensors and the field elevation may be increased to 500 feet (150 meters).

2.3 CLOUD HEIGHT SENSOR.

The cloud height sensor will be mounted on a platform/pedestal with the sensor optics a minimum of 4 feet (1.2 meters) above ground level or above maximum snow depth, whichever is higher. The sensor should be located as far as practicable from strobe lights and other modulated light sources.

2.4 VISIBILITY SENSOR.

The visibility sensor will be mounted on a platform/pedestal as free as possible from jarring and vibration. Unless otherwise specified by the manufacturer, the receiver will be pointed in a northerly direction. The sensor should be located as far as practicable from strobe lights and other modulated light sources. It should neither be located in an area that is subject to localized obstructions to vision (e.g., smoke, fog, etc.) nor in an area that is usually free of obstructions to vision when they are present in the surrounding area. It will be mounted so the optics are 10 $\pm$ 2 feet (3 $\pm$ 0.6 meters) above ground or 6 feet (2 meters) above the average maximum snow depth, whichever is higher. Ten feet (3 meters) above the ground is the preferred height. The area within 6 feet (2 meters) of the sensor should be free of all vegetation and well-drained. Any grass or vegetation within 100 feet (30 meters) of the sensor should be clipped to a height of about 10 inches (25 centimeters). These precautions are necessary to reduce the probability of carbon-based aerosols (e.g., terpenes) and insects from interfering with sensor performance. In addition, backscatter-type sensors must have a clear area for 300 feet (90 meters) in the forward (north) octant. Some sensors may require additional clear areas. The clear line of sight requirement for the sensor optics will be as specified by the sensor manufacturer.

2.5 WIND SENSOR.

The wind sensors (wind direction and wind speed) will be oriented with respect to true north. The system software will be used to make required adjustments to magnetic north. The site should be relatively level, but small gradual slopes are acceptable. It will be mounted 30 to 33 feet (9 to 10 meters) above the average ground height within a radius of 500 feet (150 meters). The sensor height shall not exceed 33 feet (10 meters) except as necessary to: (a) be at least 15 feet (4.5 meters) above the height of any obstruction (e.g., vegetation, buildings, etc.) within a 500 foot (150 meters) radius, and (b), if practical, be at least 10 feet (3 meters) higher than the height of any obstruction outside the 500 foot (150 meter) radius, but within a 1,000 foot (300 meter) radius of the wind sensor. An object is considered to be an obstruction if the included lateral angle from the sensor to the ends of the object is 10 degrees or more.

Exception: The height of a wind sensor installed on the Instrument Landing System (ILS) glide slope antenna tower or on a separate tower in area "A", Figure 1 will be reduced, as necessary, such that the height of the complete wind sensor installation (i.e., to include any required air terminal(s) and obstruction lights) does not exceed the height of the glide slope antenna installation. The minimum acceptable height for the wind sensor in this situation is 20 feet (6 meters). If side mounting (i.e., perpendicular to a tower) is necessary, a boom will be used to permit installation of the sensor at a minimum of 3 feet (1 meter) laterally from the tower. Side mounting is to be utilized only if top mounting is not practicable and the tower is of open design to allow for free air flow.

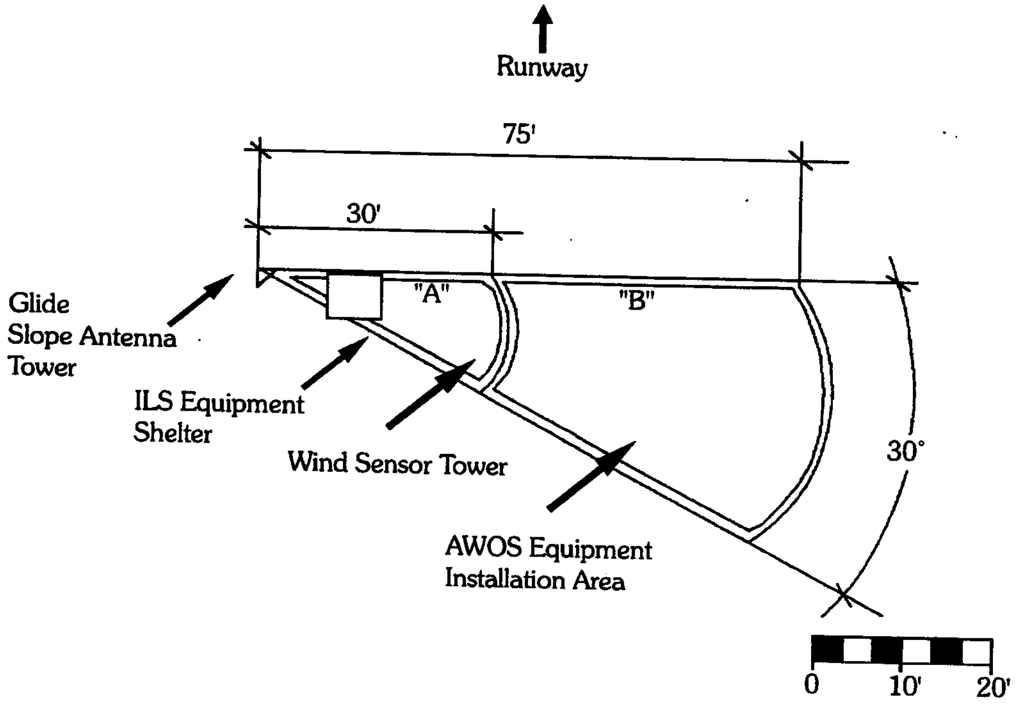


Figure 1. Precision Instrument Runway Siting

2.6 TEMPERATURE AND DEW POINT SENSORS.

The temperature and dew point sensors will be mounted so that the aspirator intake is 5 $\pm$ 1 feet (1.5 $\pm$ 0.3 meters) above ground level or 2 feet (0.6 meters) above the average maximum snow depth, whichever is higher. Five feet (1.5 meters) above ground is the preferred height. The sensors will be protected from radiation from the sun, sky, earth, and any other surrounding objects but at the same time be adequately ventilated. The sensors will be installed in such a position as to ensure that measurements are representative of the free air circulating in the locality and not influenced by artificial conditions, such as large buildings, cooling towers, and expanses of concrete and tarmac. Any grass and vegetation within 100 feet (30 meters) of the sensor should be clipped to height of about 10 inches (25 centimeters) or less.

2.7 LIGHTNING DETECTION (THUNDERSTORM) SENSOR.

The lightning detection (thunderstorm) sensor will be sited and mounted in accordance with the manufacturer's recommendations/specifications. For a single station sensor, metal obstructions will be no closer than two times their height above the sensor.

2.8 PRECIPITATION TYPE DISCRIMINATION SENSOR.

The precipitation type discrimination sensor detects precipitation and discriminates type (e.g., rain, snow). It will be mounted so that the optics are 10 $\pm$ 2 feet (3 $\pm$ 0.6 meters) above ground or 6 feet (2 meters) above the average maximum snow depth, whichever is higher. Ten feet (3 meters) above ground is the preferred height. If the system is double ended, the optical axis will be oriented generally north-south with the receiver facing north. The terrain between the receiver and transmitter should be relatively flat.

2.9 PRECIPITATION OCCURRENCE (YES/NO) SENSOR.

The precipitation occurrence sensor will be mounted in accordance with the manufacturer's specifications at a convenient height but not less than 6 feet (2 meters) above ground level or 4 feet (1.2 meters) above the average maximum snow depth, whichever is higher. Care must be taken to avoid shielding of the sensor by structures, buildings, and other obstacles.

2.10 FREEZING RAIN DETECTION SENSOR.

The siting requirements for the freezing rain sensor are the same as for the precipitation occurrence sensor.

2.11 PRECIPITATION ACCUMULATION (LIQUID OR LIQUID EQUIVALENT) SENSOR.

The precipitation accumulation sensor will be mounted so that the orifice is horizontal and in an area where the terrain is relatively flat. The orifice is defined as the upper rim edge of the collector mouth. The height of the orifice will be as close to ground level as practicable. In determining the height of the orifice, consideration will be given to keeping the orifice above accumulated/drifting snow and minimizing the potential for splashing into the orifice. Surrounding objects will be no closer to the sensor than a distance equal to two times their height above the gage orifice. An object is considered an obstruction if the included lateral angle from the sensor to the ends of the object is 10 degrees or more. In order to reduce losses due to wind, an alter-type windshield is recommended to be installed on gages in areas where 20 percent or more of the annual average precipitation falls as snow. The surrounding ground can be covered with short grass or be of gravel composition, but a hard flat surface, such as concrete, gives rise to splashing and should be avoided. Separate sensors may be used to measure liquid and frozen precipitation accumulation (e.g., rain and snow) in which case the above criteria will be followed for each installation.

2.12 SNOWFALL-SNOW DEPTH SENSOR.

The snowfall-snow depth sensor will be mounted at least 15 feet (4.5 meters) away from the wind tower over an area which would be expected to have snow cover and is representative of the area of interest. It will be mounted in accordance with manufacturer's specifications and recommendations.

2.13 COMBINATION VISIBILITY, PRECIPITATION OCCURRENCE, AND PRECIPITATION ACCUMULATION SENSOR.

The siting requirements for the visibility sensor apply to this combination sensor or any other combinations of the precipitation parameters and visibility.

CHAPTER 3

SITING CRITERIA FOR SENSOR PLACEMENT AT AIRPORTS

3.1 GENERAL.

This Chapter provides criteria for placement of sensors at airports based upon runway category (i.e., visual/nonprecision, precision without Runway Visual Range (RVR) instrumentation, and precision with RVR instrumentation). Special care is necessary in selecting appropriate locations for installation of sensors to assure that the resultant observations are representative of the meteorological conditions affecting aviation operations. Users, in applying these criteria, should consider future plans for the airport that could impact placement of sensors, e.g., installation of an Instrument Landing System (ILS), Microwave Landing System (MLS), runway construction, etc.

The site chosen for locating backup sensors shall be within 11,000 feet (3.4 kilometers) of the primary sensor array and shall have exposure and terrain equivalent to the primary sensor array site.

3.2 CLOUD HEIGHT, VISIBILITY, WIND, TEMPERATURE, DEW POINT, AND PRECIPITATION SENSORS.

3.2.1 General. No sensor siting shall violate runway or taxiway object free areas, runway or taxiway safety areas, obstacle free zones, or instrument flight procedures surfaces as described in AC 150/5300-13, Airport Design, or FAA Handbook 8260.3, TERPS. These sensors (cloud height, visibility, wind, temperature, dew point, and precipitation) should be located together near available power and communications. However, the temperature, dew point, and precipitation sensors can be placed at any convenient location on the airport that meets the sensor exposure criteria outlined in Chapter 2. FAA Sector Manager approval is required for the use of any FAA facilities, such as power, communications, shelters, towers, etc.

3.2.2 Airports with Only Visual and/or Nonprecision Runways. The preferred siting of the cloud height, visibility, and wind sensors and associated data collection platform (DCP) is adjacent to the primary runway 1,000 feet (300 meters) to 3,000 feet (900 meters) down the runway from the threshold. The primary runway is considered to be the runway with the lowest minimums. The minimum distance from the runway centerline shall be 500 feet (150 meters); the maximum distance shall not exceed 1,000 feet (300 meters). The minimum distance of 500 feet (150 meters) assumes flat terrain. If the elevation of the wind sensor site is above or below the runway elevation, then the minimum distance is adjusted by 7 feet (2.1 meters) for every foot (0.3 meters) of elevation difference. The adjustment is negative (i.e., the minimum distance is less than 500 feet [150 meters]) if the sensor site elevation is less than the runway elevation. The adjustment is positive (i.e., the minimum distance is greater than 500 feet [150 meters]) if the sensor site elevation is greater than the runway elevation.

The preferred siting should be appropriate for most airports with only visual and/or nonprecision runways. If this siting proves to be unnecessarily restrictive, the cloud height, visibility, and wind sensors and associated DCP may be sited at an alternate location on the airport provided the alternate location: (1) will assure that the resultant observations are representative of the touchdown zone of the primary runway, and (2) meets the sensor exposure criteria outlined in Chapter 2. In no case shall the site selected result in a violation of a runway or taxiway object free area, runway or taxiway safety area, obstacle free zone or instrument flight procedures surfaces described in AC 150/5300-13, Airport Design, or FAA Handbook 8260.3, TERPS.

3.2.3 Airports with Precision Instrument Runways and Without RVR Instrumentation. There are two preferred options for siting at these airports.

3.2.3.1 Option #1.

The cloud height, visibility, and wind sensors and associated DCP shall be located adjacent to the primary instrument runway 1,000 feet (300 meters) to 3,000 feet (900 meters) down the runway from the threshold. The minimum distance from the runway centerline shall be 750 feet (230 meters); the maximum distance shall not exceed 1,000 feet (300 meters). The minimum distance of 750 feet (230 meters) assumes flat terrain. If the elevation of the wind sensor site is above or below the runway elevation, the minimum distance is adjusted by 7 feet (2.1 meters) for every foot (0.3 meters) of elevation difference. The adjustment is negative (i.e., the minimum distance is less than 700 feet [213 meters]) if the sensor site elevation is less than the runway elevation. The adjustment is positive (i.e., the minimum distance is greater than 750 feet [230 meters]) if the sensor site elevation is greater than the runway elevation. In no case shall the site result in a violation of a runway or taxiway object free area, runway or taxiway safety area, obstacle free zone, or instrument flight procedures surfaces as described in AC 150/5300-13, Airport Design, or FAA Handbook 8260.3, TERPS.

3.2.3.2 Option #2.

The cloud height and visibility sensors and associated DCP shall be located behind the glide slope shelter/MLS elevation station used for the primary precision instrument runway (area "B", Figure 1).

The wind sensor shall be located either on the glide slop antenna tower or on a separate tower. The preferred location is on the glide slope antenna tower as this eliminates the potential safety concerns caused by a separate wind sensor tower. This option shall be implemented at airports that have FAA Airway Facilities technicians available and who will not be relocated as a result of remote maintenance monitoring. Under no conditions shall anyone have access to an FAA glide slope antenna tower without an FAA technician being present.

When mounted on the glide slope antenna tower, the wind sensor shall: (1) not extend above the top of the tower, (2) be mounted on a boom a minimum of 3 feet (1 meter) laterally from the tower, (3) be a minimum of 3 feet (1 meter) vertically from any antenna, and (4) be mounted on the side of the tower opposite from the glide slope antenna face.

If joint use of the glide slope antenna tower is not practical, a separate wind sensor tower shall be installed immediately behind the glide slope antenna tower (area "A", Figure 1). The height of the complete installation (i.e., tower plus air terminal(s) and obstruction lights) shall not exceed the height of the glide slope antenna tower when installed in this area.

<u>Exceptions</u>: Sensors shall not be sited in area "A" or "B", Figure 1, if the glide slope installation is in violation of a runway or taxiway object free zone, runway or taxiway safety area, obstacle free zone, or instrument flight procedures surfaces as defined in AC 150/5300-13, <u>Airport Design</u>, or FAA Handbook 8260.3, <u>TERPS</u>. An OE/AAA study shall be performed if the glide slope installation is decommissioned or relocated subsequent to the siting of the sensors in areas "A" and "B", Figure 1.

One of the above options should be appropriate for most airports with precision instrument runways and without RVR instrumentation. If both options prove to be unnecessarily restrictive, then the cloud height, visibility, and wind sensors and associated DCP may be sited at an alternate location on the airport provided the alternate location: (1) will assure that the resultant observations are representative of the touchdown zone of the primary instrument runway and (2) meets the sensor exposure criteria outlined in Chapter 2. In no case shall the site selected result in a violation of a runway or taxiway object free area, runway or taxiway safety area, obstacle free zone, or instrument flight procedures surfaces as described in AC 150/5300-13, <u>Airport Design</u>, or FAA Handbook 8260.3, <u>TERPS</u>.

3.2.4 <u>Airports with Precision Instrument Runways and With RVR Instrumentation</u>.

The cloud height, visibility, and wind sensors and associated DCP shall be sited at a location on the airport that will assure the resultant observations are representative of the meteorological conditions affecting aviation operations, and that meets the sensor exposure criteria outlined in Chapter 2. No sensor siting shall violate runway or taxiway object free areas, runway or taxiway safety areas, obstacle free zones, or instrument flight procedures surfaces as described in AC 150/5300-13, <u>Airport Design</u>, or FAA Handbook 8260.3, <u>TERPS</u>.

3.3 PRESSURE, LIGHTNING DETECTION SENSORS.

3.3.1 Pressure. The pressure sensors are not functionally constrained to be at any specific location and may be located anywhere that meets the exposure requirements in paragraphs 2.2 and 2.2.1.

3.3.2 Lightning Detection (Thunderstorm). The single station detection sensor shall be installed at any convenient location on the airport and in accordance with requirements described in paragraph 3.3.2.

CHAPTER 4

HELIPORT SITING CRITERIA

4.1 <u>NON-AIRPORT HELIPORT SITING CRITERIA</u>.

Installation of automated weather observing systems at non-airport, heliport locations shall place the sensors in the vicinity of the takeoff and landing area, and where helicopter operations will not induce transient sensor performance (e.g., rotor downwash and blowing dust causing spurious wind and visibility observations). However, no installation shall penetrate the approach and departure surfaces defined in FAA Handbook 8260.3, <u>TERPS</u>, or the surfaces defined in AC 150/5390-2, <u>Heliport Design</u>. In choosing a location, consideration will be given to both Visual Flight Rules and Instrument Flight Rules approach and departure paths and hover/taxi operations. Testing has shown no significant effect on sensors located as close as 100 feet (30 meters) from a medium weight helicopter. Another prime concern is the need to locate the sensors so as to avoid, to the maximum extent possible, conditions (sheltering and other local influences) which may result in non-representative weather observations. This may be a particular problem for heliports located in urban areas and on rooftops. The sensors, except the pressure sensors, should be located no more than 700 feet (213 meters) from the edge of the takeoff and landing area. The pressure sensor is not constrained to be at any specific location on the heliport, except to be free of rotor-induced or other pressure variations. The other sensors should be clustered for ease of installation and maintenance, but problems with non-representative sensor data or other factors may necessitate a separated location of a sensor(s).

Specific criteria for the siting of individual sensors follows (siting at airports refers to Chapter 2):

4.2 <u>PRESSURE SENSORS</u>.

Same as for siting at airports, except the height above or below MSL shall be determined for the heliport takeoff and landing area.

4.3 <u>SENSORS IN VICINITY OF TAKEOFF AND LANDING AREA</u>.

Cloud height, visibility, wind, temperature/dew point, precipitation, lightning detection (thunderstorm) sensors shall be sited as indicated in paragraphs 4.3.1 through 4.3.6.

4.3.1 <u>Cloud Height Sensor</u>.

The cloud height sensor location is the same as for siting at airports, except the height is with respect to the heliport takeoff and landing area.

4.3.2 Visibility Sensor.

The visibility sensor location is the same as for siting at airports, except the height is with respect to the takeoff and landing area. To reduce the influence of dust due to rotorwash on the reported visibility, the visibility sensor should not be sited in a location which is downwind (considering the prevailing wind direction) from the takeoff and landing area.

4.3.3 Wind Sensor.

The wind sensor will be oriented with respect to true north. The system software will be used to make required adjustments to magnetic north. The sensor will be mounted 20-33 feet (6-10 meters) above the heliport takeoff and landing area. If side mounting on a tower is necessary, a boom will be used to permit installation of the sensor a minimum of 3 feet (1 meter) laterally from the tower. Side mounting is to be utilized only if top mounting is not practicable and the tower is of open design to allow for free air flow.

4.3.3.1 Wind Sensor at Ground Level Heliports.

The wind sensor should be located to the side of the preferred approach and departure track should be away from the sheltering influence of buildings or large trees.

4.3.3.2 Wind Sensor at Rooftop Heliports.

The wind sensor on a building or other elevated structure should be located at least 20 feet (6 meters) above the highest structure to minimize the Bernoulli effect. Rooftop size may require siting of the wind sensor elsewhere to preclude penetration of an obstacle identification surface(s). In these situations, siting on an adjacent building may be a viable or even preferred option. It should be noted that many buildings are constructed to the maximum height that would not constitute a hazard to air navigation. Therefore, the above described siting may not be acceptable from an obstruction evaluation standpoint. In these cases, alternatives such as siting on an adjacent building may be necessary.

4.3.4 Temperature and Dew Point Sensors.

The temperature and dew point sensor location is the same as for siting at airports, except the height is with respect to the heliport takeoff and landing area.

4.3.5 Precipitation Sensor(s).

The precipitation sensor location is the same as for siting at airports, except the height is with respect to the heliport takeoff and landing area.

4.3.6 Lightning Detection (Thunderstorm) Sensor.

The lightning detection (thunderstorm) sensor location is the same as for siting at airports.

4.4 AIRPORT HELIPORT SITING CRITERIA.

When an automated weather observing system is to be sited at an airport which has, or is planned to include a heliport, a site should be chosen which will provide service to both runway and heliport users. The following options, in priority order, will be considered under such circumstances:

4.4.1 Option #1.

If siting in accordance with the applicable airport siting criteria (Chapter 3) would also comply with the criteria of paragraph 4.1, the system will be sited in accordance with the applicable airport siting criteria.

4.4.2 Option #2.

If siting in compliance with Option 1 is not appropriate, consideration will be given to an alternate location if such a location would enhance the representativeness of the data at the heliport without degrading the representativeness of the data at the primary airport runway. If such an alternate site is selected, a deviation will be processed in accordance with the directives of the responsible agency.

4.4.3 Option #3.

If siting in compliance with Option 1 or 2 is not possible, the system will be sited in accordance with Chapter 3, or paragraph 4.1, taking into consideration such factors as volume of fixed-wing versus helicopter traffic. If siting in conformance with paragraph 4.1 is more appropriate, a deviation to use the non-airport siting will be processed in accordance with the directives of the responsible agency.

APPENDIX A

ACRONYMS

AC	Advisory Circular
AWOS	Automated Weather Observing System
DCP	Data Collection Package
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
ILS	Instrument Landing System
MLS	Microwave Landing System
MSL	Mean Sea Level
NWS	National Weather Service
OE/AAA	Obstruction Evaluation/Airport Airspace Analysis
OFCM	Office of the Federal Coordinator for Meteorological Services and Supporting Research
TERPS	Terminal Instrument Approved Procedures

WORKING GROUP FOR SURFACE OBSERVATIONS (WG/SO)

VACANT, Chairman
Department of Commerce

LCDR CHRISTOPHER GALLAGHER, USN
Department of Defense

MR. STEVE ALBERSHEIM
Department of Transportation

CMSGT WILLIAM SCHEIB, USAF
Department of Defense

MR. JAMES FAIROBENT
Department of Energy

MR. BLAINE K. TSUGAWA, Secretary
Office of the Federal Coordinator for Meteorology

TASK GROUP FOR SURFACE INSTRUMENTATION STANDARDS (TG/SIS)

MR. JAMES L. LEHMANN, Chairman
Department of Commerce

MR. JOSEPH W. SCHIESL
Department of Commerce

CMSGT WILLIAM SCHEIB, USAF
Department of Defense

LCDR RAYMOND TOLL, USN
Department of Defense

MR. PATRICK LAYBE, USA
Department of Defense

MR. STANLEY A. CHREST, USAF
Department of Defense

MR. KENNETH KRAUS
Department of Transportation

MR. BLAINE K. TSUGAWA, Secretary
Office of the Federal Coordinator for Meteorology